

CLAIMS

1. Deagglomerated barium sulphate containing a dispersant and comprising primary particles which contain crystallization inhibitor and have an average size  $< 0.5 \mu\text{m}$ , preferably  $< 0.1 \mu\text{m}$ , in particular  $< 80 \text{ nm}$ ,  
5 more preferably  $< 50 \text{ nm}$ , with particular preference  $< 20 \text{ nm}$  and with very particular preference  $< 10 \text{ nm}$ .
2. Deagglomerated barium sulphate according to Claim 1, characterized in that 90% of the secondary barium sulphate particles are smaller than  $2 \mu\text{m}$ , preferably  $< 250 \text{ nm}$ , more preferably  $< 200 \text{ nm}$ , with  
10 very particular preference  $< 130 \text{ nm}$ , more preferably still  $< 100 \text{ nm}$  and with particular preference  $< 50 \text{ nm}$ .
3. Deagglomerated barium sulphate according to Claim 1, characterized in that the crystallization inhibitor is selected from compounds having at least one anionic group.
- 15 4. Deagglomerated barium sulphate according to Claim 3, characterized in that the anionic group of the crystallization inhibitor is at least one sulphate, at least one sulphonate, at least two phosphate, at least two phosphonate or at least two carboxylate group(s).
- 20 5. Deagglomerated barium sulphate according to Claim 1, 2, or 3, characterized in that the crystallization inhibitor is a compound of the formula (I) or salt thereof having a carbon chain R and n substituents  $[\text{A}(\text{O})\text{OH}]$ , in which R is an organic radical which has hydrophobic and/or hydrophilic moieties, R being a low molecular mass, oligomeric or polymeric, optionally branched and/or cyclic carbon chain which optionally  
25 contains oxygen, nitrogen, phosphorus or sulphur heteroatoms, and/or being substituted by radicals which are attached via oxygen, nitrogen, phosphorus or sulphur to the radical R, and
- A being C, P(OH), OP(OH), S(O) or OS(O),
- and n being 1 to 10 000, preferably 1 to 5.
- 30 6. Deagglomerated barium sulphate according to any one of Claims 1

to 5, characterized in that the crystallization inhibitor is a carboxylic acid having at least two carboxylate groups and at least one hydroxyl group, an alkyl sulphate, an alkylbenzenesulphonate, a polyacrylic acid or an optionally hydroxy-substituted diphosphonic acid.

5           7. Deagglomerated barium sulphate according to Claim 1, characterized in that the dispersant has anionic groups which are able to interact with the surface of the barium sulphate, preferably carboxylate, phosphate, phosphonate, bisphosphonate, sulphate or sulfonate groups.

10           8. Deagglomerated barium sulphate according to Claim 1, characterized in that the dispersant endows the barium sulphate particles with a surface which prevents reagglomeration and/or inhibits agglomeration electrostatically, sterically or both electrostatically and sterically.

15           9. Deagglomerated barium sulphate according to Claim 8, characterized in that the dispersant has carboxylate, phosphate, phosphonate, bisphosphonate, sulphate or sulphonate groups which are able to interact with the barium sulphate surface and which have one or more organic radicals  $R^1$  which have hydrophobic and/or hydrophilic moieties.

20           10. Deagglomerated barium sulphate according to Claim 9, characterized in that  $R^1$  is a low molecular mass, oligomeric or polymeric, optionally branched and/or cyclic carbon chain which optionally contains oxygen, nitrogen, phosphorus or sulphur heteroatoms and/or is substituted by radicals which are attached via oxygen, nitrogen, phosphorus or sulphur to the radical  $R^1$  and the carbon chain is optionally substituted by  
25 hydrophilic or hydrophobic radicals.

11. Deagglomerated barium sulphate according to Claim 9, characterized in that the dispersant is a phosphoric diester having a polyether group and a C6-C10 alkenyl group as moieties.

30           12. Deagglomerated barium sulphate according to Claims 9 to 11, characterized in that the dispersant has groups for coupling to or into polymers.

13. Deagglomerated barium sulphate according to Claim 12,

characterized in that the dispersant which prevents reagglomeration sterically is a polymer which is substituted by polar groups, such as hydroxyl groups or amino groups, and as a result thereof the barium sulphate particles are externally hydrophilicized.

5           14. Deagglomerated barium sulphate according to Claim 13, characterized in that the dispersant has polyether groups substituted by hydroxyl groups or amino groups.

10           15. Deagglomerated barium sulphate according to Claim 14, characterized in that the hydroxyl groups and amino groups function as reactive groups for coupling to or into polyepoxide resins.

16. Deagglomerated, additionally deagglomerable barium sulphate according to Claim 15, characterized in that the dispersant is a polyether polycarboxylate which is substituted terminally on the polyether groups by hydroxyl groups.

15           17. Deagglomerated barium sulphate according to any one of the preceding claims, characterized in that the crystallization inhibitor and the dispersant are each present in the deagglomerated barium sulphate in an amount of up to 2 parts by weight per part by weight of barium sulphate, preferably up to 1 part by weight per part by weight of barium sulphate, in  
20           particular in an amount of 1% to 50% by weight in each case.

18. Deagglomerated barium sulphate according to any one of the preceding claims, characterized in that it is obtainable

- 25           a) by wet-grinding a barium sulphate precipitated using a crystallization inhibitor, the wet grinding taking place in the presence of the dispersant, with the proviso that crystallization inhibitor and dispersant may also be the same, or
- b) by precipitating barium sulphate in the presence of a crystallization inhibitor and of a dispersant which prevents reagglomeration and/or inhibits agglomeration electrostatically, sterically, or both  
30           electrostatically and sterically.

19. Deagglomerated barium sulphate according to Claim 1,

characterized in that it is in the form of a suspension in water, in an organic liquid, in a mixture of water and organic liquid, or as a suspension in a plastics premix, it being possible if desired for stabilizing additives to be present, preferably acids, particularly carboxylic acids, especially acetic acid.

20. Deagglomerated barium sulphate in the form of a suspension according to Claim 19, characterized in that it is present in the suspension in an amount of 0.1% up to 70% by weight.

21. Dry powder which can be redispersed to form deagglomerated barium sulphate, obtainable by drying deagglomerated barium sulphate according to any one of Claims 1 to 20.

22. Process for preparing deagglomerated barium sulphate according to Claim 1, characterized in that

- a) precipitated barium sulphate having a primary particle size of  $< 0.5 \mu\text{m}$  is deagglomerated and optionally dried in the presence of a dispersant and water or an organic liquid or a mixture thereof, starting from barium sulphate precipitated in the presence of a crystallization inhibitor, or
- b) barium sulphate having a primary particle size of  $< 0.5 \mu\text{m}$  is precipitated in the presence of a crystallization inhibitor and a dispersant which prevents reagglomeration and/or inhibits agglomeration, and is optionally dried.

23. Process according to Claim 22, characterized in that barium sulphate with a primary particle size  $< 0.5 \mu\text{m}$ , preferably  $< 100 \text{ nm}$ , more preferably  $< 80 \text{ nm}$ , with particular preference  $< 50 \text{ nm}$ , with very particular preference  $< 20 \text{ nm}$ , more preferably still  $< 10 \text{ nm}$  is precipitated or used and the barium sulphate is optionally deagglomerated until 90% of the secondary particles are preferably  $< 1 \mu\text{m}$ , in particular  $< 250 \text{ nm}$ , more preferably  $< 200 \text{ nm}$ , with particular preference  $< 130 \text{ nm}$ , with very particular preference  $< 100 \text{ nm}$ , more preferably still  $< 50 \text{ nm}$ .

24. Process according to Claim 22 or 23, characterized in that the deagglomerated barium sulphate is dried and/or processed, optionally with

addition or removal of water, an organic liquid or a mixture of both, to give a suspension which contains water or an optionally water-containing organic liquid.

25. Plastics premix, preferably for resin systems, comprising  
5 deagglomerated barium sulphate according to any one of Claims 1 to 21.

26. Use of deagglomerated barium sulphate according to any one of Claims 1 to 21 for producing plastics and adhesives.

27. Plastics and adhesives comprising deagglomerated barium sulphate according to any one of Claims 1 to 21.

10 28. Curable compositions comprising at least one curable constituent (A) selected from the group consisting of low molecular mass, oligomeric and polymeric compounds and deagglomerated barium sulphate according to any one of Claims 1 to 21.

15 29. As an intermediate, barium sulphate with an average primary particle size < 50 nm and with crystallization inhibitor incorporated by precipitation, the crystallization inhibitor having at least one sulphate, at least one sulphonate, at least two phosphate, at least two phosphonate or at least two carboxylate groups and being a compound of the formula (I) or a salt thereof

20 
$$R-[A(O)OH]_n \quad (I),$$

in which

R is an organic radical which has hydrophobic and/or hydrophilic moieties, R preferably being a C1-C20 alkyl group or a C1-C2 alkyl group which is substituted by oxygen, nitrogen, phosphorus or sulphur or is substituted by  
25 radicals which are attached via oxygen, nitrogen, phosphorus or sulphur to the radical R, and

A being C, P(OH), OP(OH), S(O) or OS(O),

and n being 1 to 10 000, preferably 1 to 5.

30. barium sulphate according to Claim 29, characterized by a particle

size of  $< 30$  nm, in particular  $< 20$  nm, with very particular preference  $< 10$  nm.

5 31. barium sulphate according to Claim 29, characterized by a BET surface area of at least  $30 \text{ m}^2/\text{g}$ , preferably at least  $40 \text{ m}^2/\text{g}$ , in particular at least  $45 \text{ m}^2/\text{g}$  and very particularly at least  $50 \text{ m}^2/\text{g}$ .

32. barium sulphate according to Claims 29 to 31, characterized by incorporation by precipitation of citric acid as crystallization inhibitor.

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